CLAIMS

Therefore, having thus described the invention, at least the following is claimed:

1. A modified hybrid for an analog front end, comprising:

a fixed portion configured to match an effective impedance of a transmission line as seen at the analog front end and to generate a filtered replica of a local transmit signal; and

an adaptive portion containing a plurality of controllable circuit elements arranged to form a biquad and a summer to produce a transfer function configured to compensate for transmission line irregularities, wherein the adaptive portion receives the filtered replica of the local transmit signal and mathematically combines weighted signal components with a duplex signal to recover a remotely generated receive signal in a single operation at a hybrid amplifier.

2. The hybrid of claim 1, wherein the fixed portion comprises passive circuit elements.

3. The hybrid of claim 1, wherein the adaptive portion is implemented on an integrated circuit.

4. The hybrid of claim 1, wherein the biquad and the summer are implemented via a balanced differential circuit configuration.

5. The hybrid of claim 1, wherein the adaptive portion transfer function is modified to compensate for a bridged tap induced frequency notch.

6. The hybrid of claim 1, wherein the signal components comprise a band pass output a low pass output.

7. The hybrid of claim 2, wherein the passive circuit elements are selected and arranged to match the impedance of the combination of a standard isolation transformer associated with a local loop.

8. The hybrid of claim 5, wherein the bridged tap induced frequency notch comprises a range of frequencies where the phase of the local transmit signal exceeds a threshold beyond which the hybrid fails.

9. The hybrid of claim 6, wherein the signal components are weighted in the summer by controllable impedances.

10. An improved analog front end, comprising:

means for receiving a duplex signal transmission;

means for matching the effective impedance of a transmission line as seen at the analog front end in the absence of transmission line irregularities; and

means for adaptively compensating for at least one bridged tap induced frequency notch in the transfer function identifying the analog front end.

11. The analog front end of claim 10, wherein the means for receiving comprises a hybrid.

12. The analog front end of claim 10, wherein the means for matching comprises a fixed portion of a hybrid.

13. The analog front end of claim 10, wherein the means for adaptively compensating comprises a biquad and a summer.

14. The analog front end of claim 12, wherein the fixed portion of the hybrid comprises a passive network of discrete devices.

15. The analog front end of claim 13, wherein the biquad and a summer comprise a plurality of controllably selected circuit elements having various fixed impedances.

16. The analog front end of claim 15, wherein the plurality of controllably selected circuit elements comprise elements selected from the group consisting of integrated circuit resistors, capacitors, and transconductors.

17. A transceiver, comprising:

an analog front end having a modified hybrid comprising:

a first portion configured to match the effective impedance of a transmission line as seen at the analog front end in the absence of transmission line irregularities and to filter a duplex signal; and

a second portion implemented on an integrated circuit, the second portion configured to receive the filtered duplex signal and adaptively compensate for at least one transmission line irregularity observed in the absence of a remote signal transmission.

18. The transceiver of claim 17, wherein the second portion is adaptively controlled to compensate for at least one transmission line irregularity reflective of environmental conditions surrounding the transmission line.

19. A method for configuring a local transceiver to minimize the transmit power required at a remote transmitter, comprising:

applying a locally generated transmit signal to an improved front end in the absence of a remote signal, the front end containing a hybrid having a balance network further comprising a fixed portion and an adaptive portion;

optimizing the transmit signal power;

recording a reflected version of the optimized transmit signal in a receive path;

applying the adaptive portion of the balance network when indicated by at least one characteristic associated with the reflected transmit signal;

controllably adjusting the adaptive portion of the balance network to minimize the amplitude of the reflected version of the transmit signal in the receive path; and

notifying a remote transceiver to initiate a self-directed transmit signal power optimization scheme.

20. The method of claim 20, wherein the step of applying comprises supplying the locally generated transmit signal to a fixed portion of a hybrid configured to match the effective impedance of a transmission line as seen at the improved front end.

21. The method of claim 20, wherein controllably adjusting comprises performance of a steepest descent algorithm.

22. The method of claim 20, wherein controllably adjusting comprises performance of a recursive least squares (RLS) algorithm.

23. The method of claim 20, wherein the step of applying the adaptive portion of the hybrid is responsive to at least one transmission line characteristic reflective of a bridged tap associated with the transmission line.

24. A method for recovering a remotely generated signal from a transmission line in a duplex signal communication system, comprising:

applying a locally generated transmit signal to an improved front end in the absence of a remote transmit signal, the front end containing a hybrid having a balance network further comprising a fixed portion and an adaptive portion;

recording a reflected version of the optimized transmit signal in a receive path;

controllably adjusting the adaptive portion of the balance network to minimize the amplitude of the reflected version of the locally generated transmit signal in the receive path; and

combining a scaled replica of the locally generated transmit signal with a plurality of adaptive portion outputs and a duplex signal on a transmission line to recover a remotely generated receive signal from the transmission line.

25. The method of claim 24, wherein the step of applying comprises supplying the locally generated transmit signal to a fixed portion of a hybrid configured to match the effective impedance of a transmission line as seen at the improved front end.

26. The method of claim 24, wherein controllably adjusting comprises performance of an optimization algorithm.

27. The method of claim 26, wherein the optimization algorithm is selected from the group consisting of a steepest descent algorithm and a recursive least squares (RLS) algorithm.

28. The method of claim 26, wherein the step of combining comprises weighting and mathematically combining signal components with the receive signal in a single operation at a hybrid amplifier.